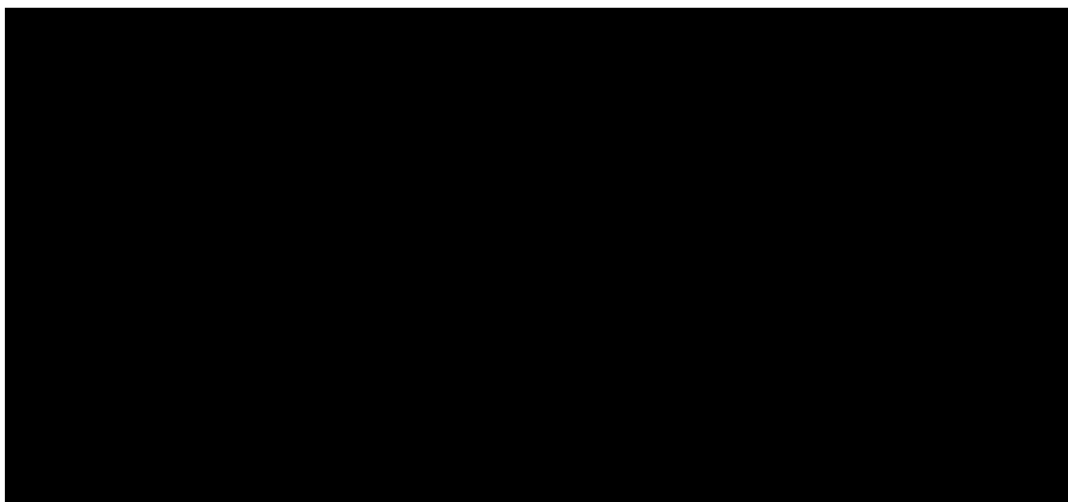


JUL 1960

CINEMATOGRAPHIC CONCEPT

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through the cinematographic technique, a PI analyst can view in stereo the total take of a mission without the awkward handling characteristics which now prevail. Every effort is being made in our research program to reduce the extraneous efforts from the analytical group and perform these elsewhere so that maximum time can be spent in making the judgment rather than bringing the material together in the proper form so that it can be viewed thus interrupting the train of thought of the human decision processes.

Several techniques can be applied and are immediately apparent. First of all, computer programming of an automated system for this type of reduction is possible for the future, secondly nominal tilt values can be applied so that the reduced materials will have approximately the correct geometry for stereo superimposition. On areas of high interest it is possible to make closed loops of the coverage so that one area can be studied for as long a time as needed by using this projection system. It is possible to vary gamma density at will through the exposure of the secondary materials thus achieving a certain amount of image enhancement and density cutting. It is possible further to have more than two stereo views of the same installation by taking the different pictures on an every-other-frame basis thus producing a high signal to noise ratio integration for the composite projection viewer. By using logically determined patterns it will be possible to exploit high resolution materials through a regular format pattern so that every square inch of the entire take

Declass Review by NIMA / DoD

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"CINEMAT"

This is the short title of a new method of reducing the photographic products of Intelligence Collection Systems so that they can be readily exploited in the PT Cell or group viewing components of the PIC/CIA.

The Cineratographic concept consists of using well established "moving pictures" techniques to achieve the reduction of high resolution, highly complex formats to a simple projection system with which the resolution and gamma can be brought to within the limits of human perception. There are many advantages to this system to produce special effects which are many times needed to achieve easily readable results. In addition, all of the basic research which PIC/CIA has spearheaded in the past 12 months in image enhancement, signal to noise ratio, rear projection stereo, variable magnification variable illumination, mathematically planned scanning techniques, multiple presentation to a group of viewers.

The equipment needed to achieve this technique is off the shelf and can either be purchased or rented. This system will need precision pin-registered cameras, highest quality lens and lighting using Koehler systems. Some of the equipment needed will, of course, be necessarily manufactured specifically for the task. However, this is minimal and involves practically no research and development.

The new scheme has the best of the features which are indicative of PIC R & D mainly. This system can be made to exploit any format - any foreseeable resolution and any geometry which is apt to be used in any collection system in being or planned.

FILM FLOW DIAGRAM

Receiving → Plotting → First Phase Preliminary MOS
&
Control

on or Duprez → Micromat PI Cell

1. Total Coverage Reduction
2. Programmed stereo
3. Variable Magnification (selected areas)
4. S/V D/C

Special effects

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THE DESIGN OBJECTIVES OF CINEMAT

In order to produce photo intelligence from aerial photography there are several conditions which need to be produced to reduce the photographic record to an easily assimilatable medium for the human being. Because of the complex nature of the photographic picture, it can record far more shades of gray and more resolution than it is possible to read directly with the human eye. Indeed, under ordinary circumstances to readout the total amount of information contained in a photograph requires the following special conditions. These are:

- a. Variable illumination for gray scale exploitation,
- b. Variable magnification for resolution exploitation combined with the condition that at various scales different kinds of intelligence are easily read out,
- c. Density cutting to provide humanly visible gray scale information by reducing over-exposed high contrast to within a useable range and the logElectronics' principle of printing sublimitable densities into the normal range.
- d. It is possible to make signal to noise ratio improvements in the image to granularity structure by integrating several frames of the same subject to produce a higher information value picture than it is possible with one single frame.

e. On very high resolution material, applying magnification of powers more than 2X to 5X, it is difficult for a person to maintain his orientation of related objects. This is true in working with maps and photographs of widely different scales, as well. Therefore, a planned scanning technique must be employed so that:

1. No detail is missed, and

2. A person has knowledge of his orientation while studying microscopic details of a small area.

Human beings do not actually follow a mathematically planned format in looking at any scene. Instead, their attention is drawn from one high-light point to another and it is possible to miss important details when examining a large area for intelligence purposes.

f. Stereo presentation is extremely important in the fact it gives some image integration as well as the 3-D effect. In order to produce useable stereo from two different oblique angles of a common area of coverage, it is possible to incline the optic axis of the recording scenic camera to accomplish a normal rectification. At this time it is only planned to do this in a normal sense so that subjective analysis can be performed within the limits of eye accommodations. Perhaps in the future, using automated systems of data reduction, refinements can be made in this area. On many present day inputs, because of the different degrees of obliquity and mixed up format presentation it is difficult to determine which areas have common stereo coverage.

g. Presently research is in progress on edge enhancement and in the area of differentiating microdensity differences by increasing

the contrast between two gray shades. This is all important in the graphic example of the white aircraft against a white runway. These things lend themselves admirably to cinema photographic techniques, i.e., the recording of cathode ray tubes by photographic means. Most all edge enhancement and microdensity differentiation is done electronically and presented on CRT's. Therefore, the well established practices for TV type recordings using cinema photography is applicable.

1. Cinemat techniques will provide for a high rate of production and a timely readout with great flexibility in the PT Cell. For instance, the copy processes can be done under laboratory conditions making use of the angular relationships which were established in the primary system there. Therefore, less care will be needed in registration, etc.

1. Automatic orientation and location between the map and the photo and the photo and its highly magnified portion can be accomplished using present day automatic plotting techniques. If in the plan of format, two means or more of photography at projection speeds are needed to cover a particular area, the copy reductions can be made at much higher frame rates and therefore cut down the amount of time which is needed to produce the viewing rate production. High speed processing at high quality under temperature controlled conditions has long been an accomplished fact in the movie industry.

1. In viewing the scanned product when an important target appears it is possible to immediately cut a small section of 50 frames from the suplicate roll and produce a closed loop projection to allow for as much time as is needed to analyze any particular target.